LATCHLESS CONTROLLER TOWER

Field of the Invention

[0001] The invention relates to the positioning and operation of controller towers for backhoes. More specifically, it relates to a method, system and apparatus for safely and securely positioning controller towers to allow the operator to easily and conveniently move the traditional swivel seat often associated with backhoe cabs into and out of the backhoe operating position.

Background of the Invention

[0002] Backhoes are often equipped with an operator station having a dual position swivel seat which allows the operator to remain seated as he/she pivots between loader and backhoe operations. Such a provision normally requires movable controller towers as controller towers that are properly located for optimum operator convenience and comfort in backhoe operation usually interfere with the operator's legs and/or with the seat as the operator pivots between backhoe and loader functions. The movable controller towers usually have two basic positions: (1) the stow position which allows the operator to move the swivel seat into and out of the backhoe operating position; and (2) the backhoe operating position which allows the operator to comfortably operate the backhoe when the swivel seat is in the backhoe operating position.

[0003] Conventional movable controller towers are mounted such that one controller tower is located on each side of the seat, each controller tower being secured in either of the two basic positions via releasable cable and latch mechanisms.

Summary of the Invention

[0004] The inventors recognize that conventional movable controller towers require a significant amount of extra hardware for cable and latch mechanisms as well as extra labor to produce and assemble the hardware. Further, the additional hardware occupies precious portions of limited available space that could be used for other valuable purposes. Finally, the transverse shaft, commonly shared by both controller towers in some conventional systems, is exposed to the detriments of the environment as it is located under the cab floor; it also reduces functionality in the

system by requiring simultaneous movement of the towers.

[0005] The invention overcomes each of the above mentioned limitations of conventional controller towers via an elegantly simple mechanism. Simple mounting brackets are fixedly attached to portions of the frame or floor on either side of the seat. A shaft, some ball bearings and a snap ring secure each tower to the mounting brackets via a hole in the brackets and serve as a pivot for the independent movement of each tower to each of its positions. A gas filled strut, operatively attached to each tower and corresponding mounting bracket, provides a toggle or over-center effect as each tower is moved from one of its two positions to the other. Thus, an operator may change the position of a tower by pushing or pulling a portion of the tower structure. Adequate extending forces of each strut keeps each of the towers in either of their dual positions, thus eliminating the need for cables and latches to lock the towers. The common rotational shaft, present in some conventional systems, is also eliminated, increasing available space on the underside of the floor for greater access to other components. Finally, the time and cost for parts and labor for each controller tower are reduced.

Brief Description of the Drawings

[0006] Embodiments of the invention will be described in detail, with references to the following figures, wherein:

Fig. 1 is a view of a work vehicle in which the invention may be used;

Fig. 2 is a side view of the invention in an operating position;

Fig. 3 is a side view of the invention in a stow position, i.e., the invention is positioned to allow a change in seat position;

Fig. 4 is an oblique view of the invention; and

Fig. 5 is an exploded view of the invention.

Detailed Description

[0007] Fig. 1 illustrates a work vehicle 10 in which the invention may be used. The particular work vehicle illustrated in Fig. 1 is a loader backhoe with a single multiple

position swivel seat 20. The multiple positions of the swivel seat 20 include at least a loader operating position and a backhoe operating position and are usually angularly spaced 180° apart. In Fig. 1, the swivel seat 20 is shown in the loader operating position. The work vehicle also has two backhoe control assemblies 100.

[0008] Fig. 2 illustrates an exemplary embodiment of a backhoe control assembly 100 in the backhoe operating position according to the invention. Figure 3 shows the same backhoe control assembly 100 in the stow position. The particular control assembly 100 illustrated is located on the left side of the seat when the seat is in the backhoe operating position. Only this control assembly 100 will be described as its working parts are identical to those of the other control assembly (not shown) on the left side of the seat. The control assembly 100 includes a mounting bracket 110, a strut assembly 120 operatively attached to the mounting bracket, a movable controller tower 130 operatively attached to the mounting bracket 110 and the strut assembly 120, a pilot controller assembly 160 and an armrest assembly 140.

[0009] The mounting bracket 110 includes a first mounting side 110a containing mounting holes 110d and 110e; a second mounting side 110b containing mounting holes 110f and 110g; and center portion 110h, including two controller tower stop assemblies 114 and 115, a hole 112 for attaching the strut assembly 120 to the mounting bracket 110, and a race 110c for pivotally attaching the controller tower 130 to the mounting bracket 110. The mounting bracket 110 is securely attached to left frame members 170 and 171 as well as the cab floor 180 via mounting holes 110d, 110e, 110f and 110g by means well known in the art. See Fig. 3 for one exemplary method of attachment in which the mounting bracket 110 is attached to right frame members 170 and 171 via bolts 171a and nuts 171b and to the floor via bolt 180a, nut 180b and via a tab 181 welded to the mounting bracket 110. Each of the stops 114 and 115 include a bolt 111a, a spacer 111b and a nut 111c.

[0010] The strut assembly 120 includes a conventional gas filled strut 121 having a first end 121a and a second end 121b. The first and second ends 121a, 121b are constructed for attachment to working structures in manners well known in the art via eyelets 122, each eyelet having three dimensional rotation characteristics.

[0011] The movable controller tower 130 includes a mounting plate 131 having two

square positioning holes 133 for positioning a first stiffening rib 137a and a square hole 136 for positioning rotationally fixed screw 126. Attached to the mounting plate, via welding are a hose harness 137a, a second stiffening rib 137b, a third stiffening rib 137c, a pivot shaft 134 and a controller cage 150. The stiffening ribs 137a, 137b and 137c are positioned as shown in Figs. 1, 2, 3, and 4 and welded to the mounting plate by means well known in the art. The controller cage 150 houses the pilot controller assembly 160 and restricts/constrains all movement of the pilot controller assembly 160 as a whole via methods and structures well known in the art.

[0012] The armrest assembly 140 includes a strong and rigid support arm 142 having a pivot hole 144 and an adjustment hole 143. The support arm 142 may be constructed of a metal such as steel. The armrest assembly 140 also includes a soft surface mounted to the support arm 142. The soft surface may be provided by a padded roller 141 rotationally mounted to the support arm 142 as in the embodiment described and illustrated herein (see Fig. 4) or a conventional soft surface mounted via a suitable means already known in the art. The support arm 142 is pivotally mounted to the controller cage via a bolt 146, a spacer 148, the pivot hole 151a in a side plate 151 of the controller cage 150 and a nut (not shown). The armrest 140 is rotationally constrained by a screw 149, a slotted hole 144 and a nut arm 145. The armrest 140 may be rigidly held in place and prevented from rotating about bolt 146 by sufficiently tightening the nut arm 145. Additionally, the rotational position of the support arm 142 may be adjusted along the length of the adjustment hole 143 by loosening the nut arm 145 sufficiently to allow movement.

[0013] The mounting plate 131 is operatively attached to the first end 121a of the gas filled strut 121 via the square hole 136, the screw 126, the spacer 129, the eyelet 122a, a spacer 123 and the nut 124. The second end 121b of the gas filled strut 121 is attached to the mounting bracket 110 via nut 124, bolt 125, hole 112, eyelet 122b and three spacers 123, 123, 123 as shown in Fig. 4. Thus, the movable controller tower 130 is operatively connected to the mounting bracket 110 via the gas filled strut 120.

[0014] The mounting plate is rotationally attached to the mounting bracket 110 via the pivot shaft 134, ball bearings 191, 192, a spacer 193, a snap ring 194 and the

race 110c. During assembly of the mounting plate 131 to the mounting bracket 110, ball bearings 191 and 192 press fit into the hole provided by the race 110c. The pivot shaft 134 is then slip fitted into the ball bearings 191 and 192, the spacer 193 is fitted over the pivot shaft 134 and, finally, the snap ring 194 is assembled to the pivot shaft 134 via shaft groove 135. Thus, movement of the mounting plate 131 at the pivot shaft 134 is constrained by the mounting bracket 110 in all directions excepting a rotational motion about an axis of the pivot shaft 134.

[0015] The gas filled strut 120 is compressive and is assembled to the controller tower 130 and the mounting bracket 110 such that it is shortest at an intermediate position between the stow and backhoe operating positions of the controller tower 130 (see Figs. 2 and 3). Thus, the gas filled strut 120 acts as a toggle mechanism which resists motion of the controller tower 130 from a first or a second position toward the intermediate position and enhances motion of the controller tower 130 from the intermediate position toward the first or the second position. Although the load applied by the gas filled strut 120 increases with decreases in its overall length, the portion of the load applied to resist movement of the controller tower 130 decreases as the angle of the strut axis approaches 90° with respect to the mounting bracket base 113. As a result of this arrangement, resistance to any motion of the controller tower 130 toward the intermediate position is highest at the stow and backhoe operating positions. Resistance to movement of the controller tower 130 toward the intermediate position tends to decrease as the distance between the position of the controller tower 130 and the intermediate position decreases. The gas filled strut 120 acts to push the controller tower 130 away from the intermediate position with a force that is proportional to the distance of the controller tower 130 from the intermediate position.

[0016] Resistance to movement from the stow position or the backhoe operating position is sufficient to keep the controller tower 130 in that position. The application force required to overcome the resistance may be preset at a minimum of, for example, 20 pounds.

[0017] The stops 114 and 115 define each of the rotational limits for movement, i.e., the stow position and the operating position, respectively, for the controller tower

130. In the stow position, surface 131a contacts the stop 114 and prevents further movement of the controller tower 130 away from the intermediate position. In the operating position, the surface 131b contacts the stop 115 preventing further movement of the controller tower 130 away from the intermediate position.

[0018] Having described the illustrated embodiment, it will become apparent that various modifications can be made without departing from the scope of the invention as defined in the accompanying claims.